



VCP gene

valosin containing protein

Normal Function

The *VCP* gene provides instructions for making an enzyme called valosin-containing protein. This enzyme is found throughout the body and has a wide variety of functions within cells. It is involved in cell division, fusing membranes within cells, reassembling cell structures after cells have divided, preventing the self-destruction of cells (apoptosis), and repairing damaged DNA.

Valosin-containing protein is part of the ubiquitin-proteasome system, which is the machinery that breaks down (degrades) unneeded proteins within cells. This system provides quality control by disposing of damaged, misshapen, and excess proteins. It also regulates the level of proteins involved in several critical cell activities, such as the timing of cell division and growth. Researchers believe that most of the functions of valosin-containing protein are directly or indirectly related to the ubiquitin-proteasome system.

Health Conditions Related to Genetic Changes

amyotrophic lateral sclerosis

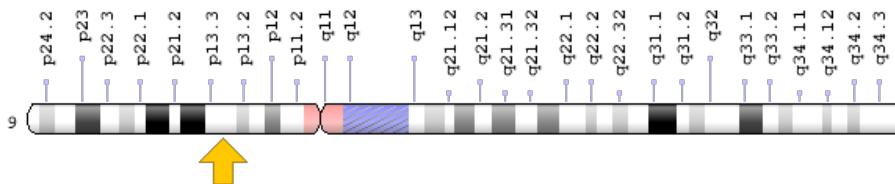
inclusion body myopathy with early-onset Paget disease and frontotemporal dementia

At least 10 mutations in the *VCP* gene have been identified in people who have inclusion body myopathy with early-onset Paget disease and frontotemporal dementia (IBMPFD). These mutations each change a single protein building block (amino acid) in valosin-containing protein. Changes in the structure of this enzyme disrupt its ability to break down other proteins as part of the ubiquitin-proteasome system. As a result, excess and abnormal proteins may build up in muscle, bone, and brain cells. The proteins form clumps (aggregates) that interfere with the normal functions of these cells. It remains unclear how damage to muscle, bone, and brain cells leads to the specific features of IBMPFD.

Chromosomal Location

Cytogenetic Location: 9p13.3, which is the short (p) arm of chromosome 9 at position 13.3

Molecular Location: base pairs 35,056,068 to 35,072,742 on chromosome 9 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- 15S Mg(2+)-ATPase p97 subunit
- IBMPFD
- MGC8560
- MGC131997
- MGC148092
- p97
- TER ATPase
- TERA
- TERA_HUMAN
- transitional endoplasmic reticulum ATPase
- yeast Cdc48p homolog

Additional Information & Resources

Educational Resources

- Eurekah Bioscience Collection: Assembly of Protein Aggregates in Neurodegeneration: Mechanisms Linking the Ubiquitin/Proteasome Pathway and Chaperones
<https://www.ncbi.nlm.nih.gov/books/NBK6166/>
- The Cell: A Molecular Approach (second edition, 2000): Protein Degradation
<https://www.ncbi.nlm.nih.gov/books/NBK9957/>

GeneReviews

- Inclusion Body Myopathy with Paget Disease of Bone and/or Frontotemporal Dementia
<https://www.ncbi.nlm.nih.gov/books/NBK1476>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28VCP%5BTIAB%5D%29+OR+%28valosin-containing+protein%5BTIAB%5D%29%29+OR+%28p97%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D>

OMIM

- VALOSIN-CONTAINING PROTEIN
<http://omim.org/entry/601023>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
<http://atlasgeneticsoncology.org/Genes/VCPIP42786ch9p13.html>
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=VCP%5Bgene%5D>
- HGNC Gene Family: AAA ATPases
<http://www.genenames.org/cgi-bin/genefamilies/set/413>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=12666

- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/7415>
- UniProt
<http://www.uniprot.org/uniprot/P55072>

Sources for This Summary

- Forman MS, Mackenzie IR, Cairns NJ, Swanson E, Boyer PJ, Drachman DA, Jhaveri BS, Karlawish JH, Pestronk A, Smith TW, Tu PH, Watts GD, Markesberry WR, Smith CD, Kimonis VE. Novel ubiquitin neuropathology in frontotemporal dementia with valosin-containing protein gene mutations. *J Neuropathol Exp Neurol.* 2006 Jun;65(6):571-81.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16783167>
- Guinto JB, Ritson GP, Taylor JP, Forman MS. Valosin-containing protein and the pathogenesis of frontotemporal dementia associated with inclusion body myopathy. *Acta Neuropathol.* 2007 Jul; 114(1):55-61. Epub 2007 Apr 25. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17457594>
- Guyant-Maréchal L, Laquerrière A, Duyckaerts C, Dumanchin C, Bou J, Dugny F, Le Ber I, Frébourg T, Hannequin D, Campion D. Valosin-containing protein gene mutations: clinical and neuropathologic features. *Neurology.* 2006 Aug 22;67(4):644-51. Epub 2006 Jun 21.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16790606>
- Ju JS, Miller SE, Hanson PI, Weihl CC. Impaired protein aggregate handling and clearance underlie the pathogenesis of p97/VCP-associated disease. *J Biol Chem.* 2008 Oct 31;283(44):30289-99. doi: 10.1074/jbc.M805517200. Epub 2008 Aug 20.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18715868>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2573070/>
- Neumann M, Mackenzie IR, Cairns NJ, Boyer PJ, Markesberry WR, Smith CD, Taylor JP, Kretzschmar HA, Kimonis VE, Forman MS. TDP-43 in the ubiquitin pathology of frontotemporal dementia with VCP gene mutations. *J Neuropathol Exp Neurol.* 2007 Feb;66(2):152-7.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17279000>
- Schröder R, Watts GD, Mehta SG, Evert BO, Broich P, Fliessbach K, Pauls K, Hans VH, Kimonis V, Thal DR. Mutant valosin-containing protein causes a novel type of frontotemporal dementia. *Ann Neurol.* 2005 Mar;57(3):457-61.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15732117>
- Song C, Wang Q, Li CC. Characterization of the aggregation-prevention activity of p97/valosin-containing protein. *Biochemistry.* 2007 Dec 25;46(51):14889-98. Epub 2007 Nov 29.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18044963>
- Watts GD, Thomasova D, Ramdeen SK, Fulchiero EC, Mehta SG, Drachman DA, Weihl CC, Jamrozik Z, Kwiecinski H, Kaminska A, Kimonis VE. Novel VCP mutations in inclusion body myopathy associated with Paget disease of bone and frontotemporal dementia. *Clin Genet.* 2007 Nov;72(5):420-6.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17935506>
- Watts GD, Wymer J, Kovach MJ, Mehta SG, Mumm S, Darvish D, Pestronk A, Whyte MP, Kimonis VE. Inclusion body myopathy associated with Paget disease of bone and frontotemporal dementia is caused by mutant valosin-containing protein. *Nat Genet.* 2004 Apr;36(4):377-81. Epub 2004 Mar 21.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15034582>

Reprinted from Genetics Home Reference:
<https://ghr.nlm.nih.gov/gene/VCP>

Reviewed: December 2008

Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services